

PRE-APPEAL BRIEF REQUEST FOR REVIEW		Docket Number (Optional) 8021-215 (SS-19582-US)									
I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to "Mail Stop AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450" [37 CFR 1.8(a)]  on _____  Signature _____  Typed or printed name _____		Application Number  10/802,150	Filed  2004-03-17								
		First Named Inventor  Keun-Hee BAI									
		Art Unit  1795	Examiner  Raymond, Brittany L								
<p>Applicant requests review of the final rejection in the above-identified application. No amendments are being filed with this request.</p> <p>This request is being filed with a notice of appeal.</p> <p>The review is requested for the reason(s) stated on the attached sheet(s). Note: No more than five (5) pages may be provided.</p> <p>I am the</p> <table border="0"><tr><td><input type="checkbox"/> applicant/inventor.</td><td>_____/Jaewoo Park/_____ Signature</td></tr><tr><td><input type="checkbox"/> assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/98)</td><td>_____ Typed or printed name</td></tr><tr><td><input checked="" type="checkbox"/> attorney or agent of record. Registration number L0302</td><td>_____ Telephone number</td></tr><tr><td><input type="checkbox"/> attorney or agent acting under 37 CFR 1.34. Registration number if acting under 37 CFR 1.34 _____</td><td>_____ Date</td></tr></table> <p>NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.</p> <p><input type="checkbox"/> *Total of _____ forms are submitted.</p>				<input type="checkbox"/> applicant/inventor.	_____/Jaewoo Park/_____ Signature	<input type="checkbox"/> assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/98)	_____ Typed or printed name	<input checked="" type="checkbox"/> attorney or agent of record. Registration number L0302	_____ Telephone number	<input type="checkbox"/> attorney or agent acting under 37 CFR 1.34. Registration number if acting under 37 CFR 1.34 _____	_____ Date
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<input type="checkbox"/> attorney or agent acting under 37 CFR 1.34. Registration number if acting under 37 CFR 1.34 _____	_____ Date										

This collection of information is required by 35 U.S.C. 132. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11, 1.14 and 41.6. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicants: Bai et al.

Examiner: Raymond, Brittany L

Serial No: 10/802,150

Group Art Unit: 1756

Filed: March 17, 2004

Docket: 8021-215 (SS-19582-US)

**FOR: ETCHING PROCESS INCLUDING PLASMA PRETREATMENT FOR  
GENERATING FLUORINE-FREE CARBON-CONTAINING POLYMER ON A  
PHOTORESIST PATTERN**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**PRE-APPEAL BRIEF REQUEST FOR REVIEW**

This paper is being filed with a Notice of Appeal Form (PTO/SB/35) and a Pre-  
Appeal Brief Request for Review Form (PTO/SB/33).

## REMARKS

Please consider the following reasons for this Pre-Appeal Brief Request For Review.

Claims 1-3, 5-17, 19-21, 23 and 24 are pending and stand rejected in the above-referenced application.

Claims 1, 2, 5, 6, 9, 10, 12, 13, 15-17, 21 and 23 stand rejected under 35 U.S.C § 103 (a) as unpatentable over Chu (U.S. Patent Publication 2004/0192058) in view of Ma (U.S. Patent 6,830,877). However, there are clear errors in the Examiner's rejection.

Claims 1, 9, and 15 recite, *inter alia*, treating the photoresist pattern comprising an ArF photoresist material with plasma generated by exciting a fluorine-free carbon-containing gas. Claim 12 recites, *inter alia*, forming a polymer layer comprising carbon on the surface of the photoresist pattern comprising an ArF photoresist material using plasma generated by exciting a fluorine-free carbon-containing gas. Claim 21 recites, *inter alia*, forming a polymer layer using plasma generated by exciting a fluorine-free carbon-containing gas, the polymer layer comprising carbon on the surface of the photoresist pattern comprising an ArF photoresist material.

As such, in the present application, an ArF photoresist pattern is treated with plasma generated by a fluorine-free carbon-containing gas. Carbon radicals from the plasma generate a polymer layer on the ArF photoresist pattern. The polymer layer formed substantially of carbon covers the photoresist pattern and protects the photoresist pattern from deformation during a subsequent etching process using plasma containing fluorine radicals. The deformation occurs because the fluorine radicals in the subsequent etching process may eat away the ArF photoresist pattern. Accordingly, due to the

polymer layer formed substantially of carbon radicals, the ArF photoresist pattern can be protected.

In the Final Office Action, the Examiner asserted that Chu discloses treating the photoresist pattern with plasma generated by exciting a fluorine-free carbon-containing gas, and the Examiner asserted that the photoresist pattern of Chu can be replaced with ArF photoresist pattern of Ma.

However, applicants respectfully submit that Chu does not disclose plasma generated by exciting a fluorine-free carbon-containing gas. In contrast, Chu discloses that the photoresist is treated with a carbon monoxide (CO) containing plasma. The CO containing gas plasma of Chu is different from a fluorine-free carbon-containing gas plasma because the CO containing gas plasma can still include fluorine. One of ordinary skill in the art understands that CO can be used, for example, in combination with  $\text{CH}_2\text{F}_2$  and  $\text{C}_4\text{F}_8$ . As such, the Examiner assertion that the CO containing gas of Chu is the same as fluorine-free carbon containing gas of the claimed embodiment is a clear error.

Furthermore, the Examiner fails to show proper motivation for modifying Chu to include an ArF photoresist of Ma. In contrast, Ma teaches away from using an ArF photoresist material in connection with treating a photoresist pattern by exciting a carbon-containing gas as described in Chu. This is because in Ma the photoresist materials including the ArF photoresist material are treated by a heat process such as curing or annealing. For example, Ma states that “it is yet another object of the present invention to provide a method for forming via openings or contact holes that have improved aspect ratios by first exposing the photoresist to UV radiation for a time period of at least 1 minute at a temperature of at least 100°C.” See col. 3, lines 28-32 of Ma. It is well

known in the art that the curing process applied to the ArF photoresist material taught by Ma is a different type of photoresist pretreatment compared to the plasma treatment by exciting a carbon-containing gas taught by Chu, because such a heat treatment of Ma takes longer and should be performed in separate chambers. Therefore, unlike the Examiner's assertion, one of ordinary skill in the art would not be led to replace the photoresist material of Chu with the ArF photoresist material of Ma.

Therefore, there are clear errors in the Examiner's rejection based on Chu in view of Ma.

Claims 1, 2, 5-10, 12, 13, 15-17, 19-21 and 23 stand rejected under 35 U.S.C § 103 (a) as unpatentable over Lindley (U.S. Patent 6,326,307) in view of Meyer (U.S. Patent 4,504,574) and Ma. However, there are clear errors in the Examiner's rejection.

In the Final Office Action, the Examiner acknowledges that Lindley fails to disclose the photoresist treatment using a fluorine-free carbon-containing gas and acknowledges that Lindley fails to disclose an ArF photoresist material is used. The Examiner relies on Meyer to disclose the use of a fluorine-free carbon-containing gas, and relies on Ma to disclose the use of an ArF photoresist.

Although Meyer discloses a carbon monoxide (CO) plasma, Meyer does not disclose that the carbon monoxide plasma is a fluorine-free carbon-containing gas. Even assuming, *arguendo*, that the CO plasma is a fluorine-free plasma, one of ordinary skill in the art would not modify a fluorine contained plasma of Lindley to include a fluorine free plasma of Meyer, because Lindley emphasizes the advantages of using fluorine contained plasma. For example, Lindley states that "the pretreatment includes difluoromethane

(CH<sub>2</sub>F<sub>2</sub>), and its presence or that of a similar hydrofluorocarbon is considered crucial for this embodiment”. See col. 8, lines 42-45 of Lindley.

Furthermore, Ma teaches away from using an ArF photoresist material in connection with treating a photoresist pattern by plasma as described in Lindley. This is because in Ma the photoresist materials including the ArF photoresist material are treated by a heat process such as curing or annealing. In contrast, Lindley describes that a heat treatment such as annealing is a different type of photoresist pretreatment from the plasma treatment performed by exciting a fluorine-free carbon-containing gas in Lindley, because such a heat treatment takes longer and should be performed in separate chambers. See e.g., col. 10, lines 2-4 of Lindley.

Therefore, there are clear errors in the Examiner’s rejection based on Lindley in view of Meyer and further in view of Ma.

An early and favorable reconsideration is earnestly solicited.

Respectfully submitted,

/Jaewoo Park/

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